Physics 102-Rec
Quiz # 4
Chapter 21

Date: 2 April 2002

Name: Key Id: Sect:

1.

(a) A Carnot refrigerator extract heat from the freezer maintained at –10 °C to the room at 25 °C. What is the coefficient of performance of the refrigerator?

$$K = \frac{T_L}{T_H - T_L} = \frac{263}{35} = 7.5$$

$$\boxed{K = 7.5}$$

(b) What is the amount of heat rejected to the room for 100 J of work is done on the refrigerator?

$$K = \frac{Q_L}{W} \Rightarrow Q_L = KW = 7.5 \times 100 = 750\,J$$

$$Q_H = Q_L + W = 750 + 100 = 850\,J$$

$$\boxed{Q_H = 850\,J}$$

2. A Carnot engine operates between two reservoirs maintained at 300 °C and 30 °C. If the heat gained the hot reservoir is 400 J for each cycle,

(a) what is the heat ~~rejected~~ expelled by the engine?

$$\varepsilon_c = 1 - \frac{T_L}{T_H} = 1 - \frac{303}{573} = 0.47 \approx$$

$$\frac{Q_L}{Q_H} = \frac{T_L}{T_H} \Rightarrow Q_L = Q_H \frac{T_L}{T_H} = 212\,J$$

$$\boxed{Q_L = 212\,J}$$

(b) what is the work done by the engine?

$$Q_H = Q_L + W \Rightarrow W = Q_H - Q_L = 400 - 212$$

$$\boxed{W = 188\,J}$$